DOCUMENT RESUME

ED 047 005 TM 000 373

AUTHOR Mitzel, Harold E.
TITLE How to Evaluate Computer Assisted Instruction.
INSTITUTION Pennsylvania State Univ., University Park.
PUB DATE 11 Nov 70
NOTE 6p.

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS Affective Objectives, Behavioral Objectives, Cognitive Objectives, *Computer Assisted Instruction, Educational Innovation, *Educational Objectives, *Educational Technology, Evaluation, *Evaluation Criteria, *Program Evaluation, Teaching Techniques

ABSTRACT

Rather than presenting a cookbook recipe for how to evaluate computer assisted instruction (CAI), a number of queries relevant to the evaluation of CAI are presented and explicated. (1) Is it possible that CAI offers opportunities to reach cognitive instructional objectives to which users of conventional methods do not aspire? (2) Is it reasonable to compare CAI and conventional methods performance in a single subject like mathematics when the pupils under study are enrolled in four or five other subjects (e.g., history, health, English, foreign languages, etc.) taught by conventional processes? (3) How does one in an overall evaluation of CAI ensure the proper weighting of cognitive criteria based on pupil achievement, and affective criteria based on pupil attitudes and feelings? (4) If we classify the dependent variables of CAI evaluation into two categories, obtrusive and unobtrusive, or both equally persuasive to decision makers? Some suggested unobtrusive measures are length of attention span, mastery time, and absentee rate. (CK)

EDO 47005

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Remarks Prepared for
NAUCAL Conference
Washington, D.C.
November 17, 1970

How to Evaluate Computer Assisted Instruction

Harold E. Mitzel
The Pennsylvania State University

I was attracted to my assigned title, "How to Evaluate Computer Assisted Instruction," more for its elegant simplicity than by any feeling that I knew the answer to its implied profound question. We can undoubtedly all agree that there are more instances of the negative, "How NOT to evaluate CAI!" than of the positive. A long boring paper could easily be prepared on the latter or negative question but I doubt if it would be very constructive.

I want to admit that I don't know *how* to evaluate CAI in the sense that a man who has done it can tell you how to shear a sheep or *how* to row a boat. All of us concerned with this potential innovation in American education are groping for solid information on which to base decisions. My purpose today, rather than to give you a recipe, is to present and explicate a number of queries relevant to the evaluation of CAI which may come in handy in the months and years ahead.

Definitional Groundrules.

Following Scriven's nomenclature, it is useful to divide evaluation activities into two major classes: (1) formative, and (2) summative. This is a good dichotomy, but, for our purposes, I am assuming that the program committee in choosing the title, "How to Evaluate CAI," was really thinking about hard-nosed summative evaluation, the kind on which important educational decisions

TM 000 373

SHOULD BE BASED. FURTHER, I TAKE IT THAT "TO EVALUATE" MEANS TO COMPARE A RESULT OR PHENOMENON WITH SOME ACCEPTED STANDARD OR SOME MEASURABLE CRITERION. JUST TO MAKE IT STAND OUT LET'S AGREE TO RESTRICT CAI TO THE TUTORIAL USE OF THE COMPUTER, RECOGNIZING OF COURSE THAT IT IS QUITE IN ORDER TO REFER TO A VARIETY OF COMPUTER APPLICATIONS IN EDUCATION AS COMPUTER ASSISTED INSTRUCTION. WITH THESE GROUNDRULES STATED, LET US NOW TURN TO A CONSIDERATION OF SOME QUERIES TO BEAR IN MIND WHEN PLANNING AN EVALUATION OF A COMPUTER ASSISTED INSTRUCTION PROGRAM AS COMPARED WITH ONE OR MORE CONVENTIONAL PROCEDURES.

QUERY #1 IS IT POSSIBLE THAT CAI OFFERS OPPORTUNITIES TO REACH COGNITIVE INSTRUCTIONAL OBJECTIVES TO WHICH USERS OF CONVENTIONAL METHODS DO NOT ASPIRE?

THIS IS A VERY SERIOUS QUESTION TO PUT TO ANY PROPOSED COMPARISON OF MASS INSTRUCTION PROCEDURES WITH A RICH PROGRAM OF INDIVIDUALLY ADAPTIVE INSTRUCTION. MASS INSTRUCTION IMPLIES UNIFORM OBJECTIVES FOR ALL LEARNERS AS ASSESSED BY UNIFORM ACHIEVEMENT MEASURES. ADAPTIVE EDUCATION, ON THE OTHER HAND, MADE POSSIBLE BY COMPUTER ASSISTED PROGRAMS, IMPLIES THAT GOALS OF INSTRUCTION ARE FLEXIBLE AND CAN BE DIFFERENT FOR EVERY LEARNER DEPENDING UPON HIS NEEDS AND INTERESTS.

CONCERNED OBSERVERS ARE SAYING THESE DAYS THAT THE JOY AND THE JUICE OF LIFE HAVE GONE OUT OF SCHOOL EXPERIENCES; THAT THERE IS NO SPONTANEITY IN TEACHING AND LEARNING, PARTICULARLY IN DISADVANTAGED NEIGHBORHOODS. NO ONE CAN TELL HOW MUCH OF THIS CHARGE SHOULD BE LAID AT THE DOOR OF A TOO RIGID ADHERENCE TO THE CANONS OF CLASSICAL EVALUATION AND CLASSICAL CURRICULUM BUILDING, BUT THERE IS ENOUGH MECHANISTIC, JOYLESS, SCHOOLKEEPING IN THE COUNTRY TO WARN THE SUMMARY AND MINDLESS EVALUATOR WHO TRIES TO ASSESS CAI IN A SCHOOL SETTING. THE POINT IS THAT

SENSITIVE AND ADAPTIVE CAI PROGRAMS KEYED TO THE NEEDS OF INDIVIDUAL LEARNERS MAKE IT POSSIBLE FOR TEACHERS IN SUCH AN ENVIRONMENT TO HELP PUPILS SET THEIR OWN UNIQUE LEARNING GOALS. BECAUSE THEY ARE UNIQUE TO EACH LEARNER, THESE GOALS CANNOT VERY WELL BE ANTICIPATED IN ADVANCE AND PUT INTO A CONVENTIONAL SET OF BEHAVIORAL OBJECTIVES OR INCLUDED IN AN OBJECTIVES-BASED ACHIEVEMENT TEST.

IN AN ABSTRACT SENSE, THE ANSWER TO QUERY #1 IS "YES," THE GOALS OF INSTRUCTION CAN BE DIFFERENT WITH CAI THAN WITH REGULAR FARE, AND WE AS EVALUATORS HAVE TO FACE THE POSSIBILITY THAT CAI AND CONVENTIONAL INSTRUCTION DO NOT HAVE SUFFICIENTLY COMMON OBJECTIVES TO MAKE A SUMMATIVE EVALUATION MEANINGFUL.

QUERY #2 IS IT REASONABLE TO COMPARE CAI AND CONVENTIONAL METHODS PERFORMANCE IN A SINGLE SUBJECT LIKE MATHEMATICS WHEN THE PUPILS UNDER STUDY ARE ENROLLED IN FOUR OR FIVE OTHER SUBJECTS (I.E. HISTORY, HEALTH, ENGLISH, FOREIGN LANGUAGES, ETC.) TAUGHT BY CONVENTIONAL PROCESSES?

THIS QUESTION WONDERS OUT LOUD WHETHER THE QUICK AND DIRTY CAI EVALUATION IN A SINGLE SUBJECT IS MEANINGFUL IF IT FAILS TO TAKE INTO ACCOUNT SIMULTANEOUS PUPIL EXPERIENCES IN THE REST OF THE CURRICULUM? THE COROLLARY IS, OF COURSE, THE PROBLEM OF EVALUATION IF YOU INTRODUCE PUPILS TO CAI METHODOLOGY FOR THE FIRST TIME AT THE NINTH GRADE. DO THE SCHOOL PROCESS EXPERIENCES IN A SINGLE ACADEMIC YEAR OVERCOME THE METHODOLOGICAL IMPACT OF EIGHT PREVIOUS YEARS OF CONVENTIONAL INSTRUCTION? WHO KNOWS? THE POSSIBLITY MUST BE ENTERTAINED, HOWEVER, THAT THE EDUCATION COMMUNITY CAN OBTAIN NO REALLY SATISFACTORY EVALUATION OF CAI UNTIL WE DEVELOP SOFTWARE FOR A FAIRLY COMPLETE ELEMENTARY AND SECONDARY CURRICULUM. THIS FAIRLY COMPLETE CAI CURRICULUM MAY THEN HAVE TO BE EMPLOYED WITH A

STABLE STUDY GROUP PROGRESSING FROM GRADES 1 TO 12 FOLLOWED BY CAREFUL EVALUATION OF POST-HIGH SCHOOL CAREERS.

THE DIFFICULTY OF SEPARATING THE METHODOLOGY OF INSTRUCTION FROM THE ATTITUDES AND EXPECTATIONS OF PUPILS, TEACHERS, PARENTS, AND ADMINISTRATORS SHOULD NOT BE LOST ON THE POTENTIAL EVALUATOR. I KNOW A HIGH SCHOOL IN WHICH A STRONG CAI PROGRAM HAS BEEN INTRODUCED, ONE THAT ENABLES EVERY PUPIL TO PROCEED THROUGH THE CAREFULLY PREPARED CURRICULUM AT AN INDIVIDUALIZED PACE. YET, THE TEACHERS AND THE ADMINISTRATION CLING DESPERATELY TO CONVENTIONAL CONCEPTS OF TESTING FOLLOWED BY PUPIL MARKING, WITH ITS CONCOMITANT LABELS "PASSING" AND "FAILING." EVEN THOUGH THEY NOW HAVE A TOOL WHICH CAN DEAL CONSTRUCTIVELY WITH INDIVIDUAL DIFFERENCES, A TOOL WHICH ENABLES EDUCATORS TO THINK ABOUT PUPIL MASTERING OF SUBJECT MATTER AS AN ATTAINABLE GOAL, THE TEACHERS SAY THE "SYSTEM" PREVENTS THEM FROM CHANGING FUNDAMENTAL PRACTICES IN SCHOOLS. NO DOUBT THEY ARE RIGHT ABOUT SCHOOL SYSTEM CONSTRAINTS, AND THE EVALUATION OF CAI MUST FIND WAYS TO REMOVE THOSE PHILOSOPHICAL AND ATTITUDINAL BIASES TO A CRITICAL TRIAL.

Query #3. How does one in an overall evaluation of CAI insure the proper weighting of cognitive criteria based on pupil achievement, and affective criteria based on pupil attitudes and feelings?

PRESUMABLY, IF ALL OF THE PUPILS JUST LOVED CONVENTIONAL INSTRUCTION AND UNIFORMLY HATED CAI, THERE WOULD BE LITTLE REASON TO PURSUE CRITICAL EVALUATION OF CAI USING COGNITIVE CRITERIA. INSTEAD, BECAUSE OF WIDE VARIATION IN CONDITIONS AND EXPECTATIONS, WE HAVE TO TRY TO STRIKE A BALANCE IN CRITERION DEVELOPMENT BETWEEN LIKING FOR SCHOOL AND LEARNING THE CONTENT. INCREASING ABSENTEEISM IN

URBAN SCHOOLS IS BRINGING MORE AND MORE INTO THE AWARENESS OF EVALUATORS HOW IMPORTANT IT IS FOR CHILDREN TO BE INTRINSICALLY MOTIVATED BY SCHOOL ACTIVITIES. THAT CONVENTIONAL SCHOOLING NOW TURNS MANY KIDS OFF IS BECOMING PAINFULLY OBVIOUS. ON THE OTHER HAND, RECENT EXPERIENCE SHOWS THAT A GREAT MANY CHILDREN ARE ATTRACTED TO THE RESPONSIVE ENVIRONMENT PROVIDED BY INTERACTION WITH COMPUTER TERMINALS. THESE SAME STUDENTS ARE QUICK TO IMPUTE MORE WISDOM, MORE AUTHORITY AND MORE WARMTH TO COMPUTER EQUIPMENT THAN TO THEIR ASSIGNED INSTRUCTORS. THE ANSWER TO QUERY #3 IS OF COURSE THAT BOTH PUPIL ACHIEVEMENT AND PUPIL FEELINGS HAVE TO BE INCLUDED AS CRITERIA FOR A COMPREHENSIVE EVALUATION OF CAI.

QUERY #4 IF WE CLASSIFY THE DEPENDENT VARIABLES OF CAI EVALUATION INTO TWO CATEGORIES, OBTRUSIVE AND UNOBTRUSIVE, ARE BOTH EQUALLY PERSUASIVE TO DECISION MAKERS?

PREVIOUSLY, WE HAVE DISCUSSED ONLY MEASURES OF ACHIEVEMENT AND ATTITUDE WHICH ARE DELIBERATELY EMPLOYED BY THE EVALUATOR IN TRYING TO ASSESS DIFFERENCES BETWEEN CAI AND CONVENTIONAL INSTRUCTION. THERE IS, HOWEVER, A NEW CLASS OF MEASURES CALLED UNOBTRUSIVE WHICH MAY HAVE GREAT RELEVANCE FOR THE CAI EVALUATION PROBLEM. EXAMPLES OF SOME UNOBTRUSIVE MEASURES USEFUL IN CAI ENVIRONMENTS MIGHT BE MEASURED BY LENGTH OF ATTENTION SPAN, LENGTH OF TIME REQUIRED TO ACHIEVE SUBJECT MASTERY, ABSENTEE RATE, AND NUMBER OF TEACHER REPRIMANDS PER UNIT OF TIME, TO NAME ONLY A FEW. THESE UNOBTRUSIVE MEASURES HAVE AS MUCH TO DO WITH THE QUALITY OF THE PROCESS OF EDUCATION AS THEY HAVE TO WITH THE PRODUCT. I FEEL THAT MOST LAYMEN AND MANY EDUCATORS ARE NOT PREPARED TO UNDERSTAND OR ACCEPT CRITERIA THAT ARE NOT DIRECTLY CONCERNED WITH THE ACHIEVEMENT OF COGNITIVE OBJECTIVES. YET, THE HISTORY OF METHODS RESEARCH IN EDUCATION WITH ITS TYPICAL

FINDINGS OF "NO SIGNIFICANT DIFFERENCES" SHOULD WARN US TO BE WARY OF PUTTING ALL OF OUR CHIPS ON SIMPLISTIC ACHIEVEMENT OBJECTIVES.

INSTEAD OF GIVING YOU A COOKBOOK SOLUTION TO THE MAJOR QUESTION OF THE EVALUATION OF CAI, I HAVE TRIED TO POSE SOME USEFUL QUERIES ABOUT THE WHOLE PROCESS. GIVEN AN OPPORTUNITY, I THINK CAI WILL CHANGE EDUCATION IN FUNDAMENTAL WAYS. THE DANGER IS THAT WE MAY BE ATTEMPTING TO PUT NEW WINE IN OLD WINESKINS WITH THE ANTICIPATED TRAGIC RESULTS.